BULLETIN NO. 17. (Dairy No. 8.)

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF ANIMAL INDUSTRY.

DAIRY SCHOOLS.

BY

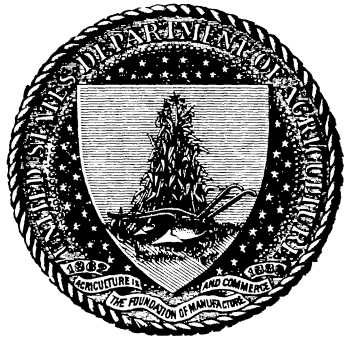
R. A. PEARSON, B. S.,

Assistant Chief of Dairy Division.

Under the direction of

Dr. D. E. SALMON,

Chief of the Bureau of Animal Industry.



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., November 13, 1896.

SIR: I have the honor to transmit herewith the manuscript of an article on "Dairy Schools," prepared under the supervision of Henry E. Alvord, Chief of Dairy Division of this Bureau, and to recommend its early publication as a bulletin of this office. Dairy schools have been established in this country only a few years, but the good results of their work are already apparent. Many dairymen do not know of these schools or have only a vague idea of them, and it is the purpose of this bulletin to spread information on these points and to show some of the advantages of special training in dairy lines. An appendix to the bulletin contains statements of the facilities for instruction in dairying in the States and Territories.

Respectfully,

D. E. SALMON,
Chief of the Bureau of Animal Industry.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

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DAIRY SCHOOLS.

DAIRY INSTRUCTION.

The fact that a young man has attended a dairy school and has successfully completed the course there offered, commends him to anyone looking for a person to fill a responsible position in a creamery or cheese factory or to take charge of a farm dairy. Scientific education in agricultural lines is no longer looked upon as impracticable and useless, and the one possessing it is not now necessarily considered a theorist; on the contrary, education is regarded with more and more favor, it is recognized that practice and science are closely connected, and yield the best results when they are made to depend upon each other; rules of thumb can not compete with applied science. So far as special training is concerned, dairying is not different from other lines of industry, and in these times of rapid scientific and technical advancement and severe competition in all trades and professions, it is found that the butter and cheese maker and the dairyman are as much in need of the best and latest information relating to their work as the horticulturist or mechanic or tradesman is in need of the latest knowledge in his line.

Modern advances in dairy knowledge have been rapid; the scientist and inventor have caused the apparatus and routine in use a quarter of a century ago to be almost entirely discarded and replaced by more profitable machinery and more accurate methods. Although inventions of improved dairy machinery and scientific investigations in the field of dairying are comparatively recent, important discoveries and corresponding changes in methods of work have already been made. It is probable that these improvements have not much more than begun, and the results that have been obtained and will be obtained are certain to have a marked effect on the production and care of all dairy products. It is well known that the methods of butter making practiced twenty years ago can no longer be followed with profit; with modern aids more butter can be made from a given amount of milk of a given quality than it was then possible to produce.

Another feature of dairying which has undergone great change in late years is the market value of dairy products. The prices of milk, butter, and cheese have recently been so low and the cost of production

has so nearly equaled the market values of the products most economically produced, that it has become absolutely necessary to turn everything in dairy operations to the greatest possible gain if one would succeed in profitably producing milk, butter, or cheese. Skill and keen judgment are constantly required by the successful dairyman; no simply imitative methods can be depended upon if the best results are expected.

The changing conditions of the dairy industry, viz, its rapid advances in means and methods of manufacture, larger production of goods not always the best, and severe competition, have seemed to make it necessary to provide some places for giving instruction in the most advanced dairy methods. Dairy schools have been established to meet this pressing need, and their establishment marks an important era in the history of agricultural education. Soon after the organization of agricultural colleges it was learned that they could not reach, through the long courses, the great majority of dairymen and butter and cheese makers who needed practical and theoretical instruction. Shorter courses were offered, with varying success, and it was finally decided to give instruction in dairying alone for a few weeks each winter. This departure has proved to be a boon to dairying. Dairy schools are now found in every State where dairying is a prominent industry, and other States are ready to give similar opportunities for dairy instruction as soon as it is needed. These schools are usually connected with State agricultural colleges which furnish instructors and equipment. In a few States splendid buildings have been erected for the single purpose of dairy teaching. In other States creameries or cheese factories or buildings containing both have been erected for the practical operations, and class-room work is conducted in the college buildings. Schools with the largest equipment are naturally located in the chief dairy States.

PURPOSE OF DAIRY SCHOOLS.

It is the purpose of dairy schools to teach young men or women, in a short time, as much as possible of the theory of the different lines of work connected with dairying; and these theories are illustrated, so far as practicable, in actual practice at the churn, cheese vat, or other apparatus. They aim to so equip one who has had some practical work that he will be able to take full charge of a plant and make the best possible product. And they attempt to teach one who has had little or no practical training the things that it took his father many years to learn. They aim to improve the quality of our dairy products and to reduce the cost of their production by teaching new and advanced principles, together with methods which have been proven to yield the best results. There is no reason why as good butter or cheese can not be produced in this country as is made in any part of the world, yet it is a painful fact that, while many of our manufactured products excel all of their kind made in other lands, our dairy products can not compete in foreign markets with the butter and cheese of several coun-

tries. Our successful competitors depend on their herds for their daily bread. They realize that it is to their interest to thoroughly understand every step in their work and have carefully organized systems of dairy instruction which have been conducted for years.

It is not the purpose of short dairy courses to displace longer courses in agriculture. Each has its own place in the field of agricultural instruction, and dairy schools occupy a place that had been practically vacant. The long course of agriculture which requires four years for completion is thorough and comprehensive, and if one desiring dairy training can take that it is undoubtedly the best thing to do. Four years is none too much time to devote to the study of dairying and closely allied subjects. If it is possible to spend only two years and few outside subjects are taken, a good training can be obtained in that time. By taking these longer courses one can obtain all the instruction given in the short course and a great deal more; in fact, he has an opportunity to learn much that is now known of dairying and at the same time gain a fair knowledge of agriculture, chemistry, bacteriology, and other subjects allied to dairying and of general importance and interest. But the full course in agriculture or a special course of one or two years requires time and money for preparation and completion, and it is, therefore, beyond the means of many to take either of them.

There is a large class of ambitious young men and women who can not afford a long course at college, and of others who are not interested in anything but dairying, strictly. With many the time is limited and they prefer to become as proficient as possible in one line, rather than attempt to get a few ideas in several different lines. It is for such as these, chiefly, that short dairy courses have been arranged, and it is endeavored to place them within the reach of all, as one of the first necessary steps toward the improvement of our dairy products is education of the *many* makers of butter and cheese. Each one must be properly trained, and schools adapted to but a few could not accomplish that end.

The dairy schools receive without special preparation any who are actually engaged in making butter or cheese, or who intend to make that their business. The work is so arranged that an intelligent person can get great help by devoting all his time for a few weeks to the study of dairy methods under the guidance of competent instructors. It must not be thought that all the complexities of dairying can be learned in a few weeks or months, but in this short period many useful ideas, advanced principles and methods can be obtained.

METHOD OF CONDUCTING DAIRY SCHOOLS.

As the most active season of dairying is in the spring, summer, and fall months, the period of work of the dairy schools has been placed in the winter, thus enabling many who are in charge of factories to finish the season's work, take the course, and open the factory the following

spring, while others whose factories run the whole year can be relieved of the work for a few weeks in winter more easily than any other time. The schools being established for those who can attend but a short period, the work is so planned that on each week day the student's time is fully occupied. Care is taken to have the scientific and practical instruction so closely related that one will help the other in the daily work. The student is not only told in lectures how to make good butter and cheese, but he is shown the complete process and performs the work himself until familiar with it. After he learns the principles of making a first-class product he is shown how to judge or score it, a blank like the following being used:

Blank used for judging butter at the Wisconsin Dairy School.

Report by ..... Date, ..., 189 .

No. of sample.....							
Scale of points.							
Flavor.....	40	.....	.....	.....	.....	.....	.....
Grain.....	30	.....	.....	.....	.....	.....	.....
Color	15	.....	.....	.....	.....	.....	.....
Salt.....	10	.....	.....	.....	.....	.....	.....
Package.....	5	.....	.....	.....	.....	.....	.....
Total	100	.....	.....	.....	.....	.....	.....

This is an important exercise and a great help in detecting just where an error was made in the process of manufacture. It is also an aid to understand the expert criticisms of the product after it has reached market.

The subjects in which instruction is given depend largely on the condition of dairying in the State where a school is located. General lectures on dairying are given at all schools, and instruction in the use of the Babcock and lactometer tests and in butter making is always given. Cheese making is an important industry in only a few States, and the fullest instruction in that branch may be expected in those States where the most cheese is made. The pasteurization and sterilization of milk with different kinds of machines, and the preparation of milk for the retail city market, are taught in some States. A few schools have most excellent facilities for advanced work and original investigation in dairy lines, and students who are proficient in the elementary work are encouraged to take up something more advanced. The science of dairying offers a promising field for investigation and good reward for successful work. Many short-course students have become so interested in this that they have been led to take a full four years' course in agriculture after completing the short course, and have become leading authorities on agricultural matters in their communities. Sufficient practical engineering is given in some schools to enable one to do his own steam fitting, plumbing, belting, and simple repairing. Some bacteriology is taught and an effort made to impress the

fact that bacteria are the chief cause of good or harm in the dairy. Under the head of chemistry, is taught the composition of milk and its products and the relations of their several parts. In a few cases students have opportunity to perform some simple operations in milk analysis, thus making a better impression on their minds than can be done by lectures alone.

The class usually assembles at 8 o'clock in the morning to take one or more lectures, which are intended to cover much more ground than the practical work. Some of the subjects discussed and which were not mentioned above are breeds, breeding, feeding and animal nutrition, selecting and judging cattle, manures, farm buildings, market quotations and requirements, veterinary science, law, and creamery bookkeeping.

Special attention is given to the lectures directly bearing on the daily practical work. The importance of having the best milk is clearly shown. All the details of handling milk both before and after delivery to the factory are explained. These include milking, straining, aerating, cooling, care previous to delivery, and hauling to factory; also the receipt of milk at the factory, the examining, weighing, sampling, and conducting to milk vat. The lectures on testing milk briefly describe the simplest tests which have been used and fully explain the method devised by Dr. Babcock. The payment for milk according to its fat content is explained and illustrated. In the lectures on butter making, every step of the work from taking the milk from the vat to shipping butter to the market is fully described. The lectures on cheese making cover that subject from the receipt of the milk to the shipment of cheese. Instruction is usually given in cheddar-cheese making only, but in some schools the manufacture of several kinds of cheese is described. The advantages, disadvantages, and best methods of pasteurization and sterilization are explained in some courses of lectures. The proper method of constructing dairy buildings is discussed, special importance being given to the sanitary side, the disposal of skim milk and waste products, laying of drains, etc.

The part of the instruction upon which most dependence is placed is the practical work. It is by means of this that new ideas are most effectually fixed in the minds of students. This should never be considered as manual labor, as it is not that in any sense. When the classroom work is completed different sections of the class are assigned to various duties in connection with practical dairy work, such as receiving milk, tending to separators, churning, cheese making, and pasteurizing and testing milk, and the assignments of the different sections are changed regularly, so that each student has an opportunity to gain experience in each branch of the work. In some schools the class is divided into three sections, each section working in the butter room, cheese room, and laboratory by turns. These sections are again divided into smaller sections and assigned by the instructor to perform different

duties; for example, of those assigned to the butter room some take charge of the separators, others attend to the churning, while others print and pack butter. All the work is executed under the immediate supervision of a competent instructor and careful attention to details is required. When a student is assigned to any duty a report blank is given him similar to those here shown. It provides for reporting each step in the work, and thus teaches accuracy and observation.

Blank used for milk-testing report at the New York Dairy School.

Report by ..... Date, ..., 189 .

No. of sample.	No. of bottle.	Lactometer reading.	Temperature.	Specific gravity at 60° F.	Per cent of fat.	Solids-not-fat.	Adulteration, kind and amount.

Blank used for separator report at the Iowa Dairy School.

Date, ... By .....

Temperature of milk when received		Speed of separator 5 minutes after starting	
Temperature separated		Speed of separator 30 minutes after starting	
Which separator used		Speed of separator 1 hour after starting	
Started separator at		Pounds of milk run through per hour	
Reached full speed at		Temperature of skim milk	
Fat in skim milk 5 minutes after starting		Temperature of cream	
Fat in skim milk 30 minutes after starting		Temperature of cream in vat	
Fat in skim milk 1 hour after starting		Temperature of water surrounding vat	
Solids-not-fat in skim milk 1 hour after starting			
Fat in cream 1 hour after starting			

Remarks:

Blank used for cheese-making report at the New York Dairy School.

Report by ..... Date, ..., 189 .

Vat used	Time of first curdling
Condition of milk	Minutes taken
Weight of milk	Time cut
Rennet test for ripeness	Minutes taken
Temperature set	Time steam turned on
Amount of rennet used	Minutes taken
Rate of rennet per 1,000 pounds milk	Time steam turned off
Hot iron test when dipped	Minutes taken in raising to ..... degrees
Hot iron test when ground	Time dipped
Weight of salt used	Minutes taken
Rate of sale per 1,000 pounds milk	Time ground
Per cent of fat in milk	Minutes taken
Per cent of fat in whey	Time salted
Weight of fat lost	Minutes taken
Kind of cheese	Time put to press
Number made	Whole time for setting
Weight of green cheese	Time dressed
Weight of milk for 1 pound green cheese	Time taken from press
Serial number	Length of time in press
Time set	

Remarks:

Farm dairying, or the making of dairy products on a small scale, is usually taught in the short course of agriculture with other subjects,

such as horticulture, general agriculture, and entomology. In most of the States where the factory industry is not extensive and the classes in dairying are not too large, the farm dairy instruction is given in connection with the creamery and cheese factory work. In this course it is endeavored to show how to make good butter in small amounts and with ordinary utensils, such as are found on the average dairy farm, as well as with the most approved aids. Lectures are usually given on breeding, feeding, and judging dairy cattle, management of the dairy, diseases of the dairy cow, the composition of milk, and the manufacture of dairy products. Practical work is included in separating cream by gravity and by hand separators, and making butter in small amounts and preparing it for the market. These courses have enabled many farmers to so improve their butter as to increase its price 2 or 3 cents a pound.

REQUIREMENTS FOR ADMISSION.

The entrance requirements to dairy schools are such as to debar no worthy person who really desires to attend. Any person of good character who wishes to study dairying and is capable of understanding the lectures and doing the practical work will be admitted to almost any school. In some cases there are age requirements, and in a few instances examinations are given or statements must be presented showing that the applicant has had a certain amount of experience in a cheese factory or creamery. These easy entrance requirements, however, should not encourage anyone who is not fitted for the work to attempt to take it. An applicant should be at least 16 years old, and it is well to have some knowledge of farm and dairy methods, although some of the best results have been shown by ambitious young men from the city who knew nothing of cattle or milk before taking the course. One should be possessed of a common school education, be able to read and write, and understand fractions, percentage, and decimals. Without such knowledge it is possible to make good butter or good cheese, but not possible to take charge of testing milk or apportioning dividends. Each student entering a dairy short course should have a strong desire to become expert in some part of the work, and this fact should be kept in mind throughout the course.

Women are usually admitted to the schools on the same conditions as men. They have always been interested in the farm dairy, and are now successfully taking charge of large dairy plants. It would seem a great mistake to exclude anyone engaged in dairying from attending a dairy school, which should be ready to aid as many as possible.

CERTIFICATES AND PRIZES.

Certificates are awarded by some schools to students successfully completing the course. These do not necessarily recommend the holder to fill any position in a creamery or cheese factory, but usually simply

state that he has creditably finished the prescribed work. Such a one is here shown:

Certificate awarded by the New Hampshire Dairy School.

This certifies that ——— ——— has been a regularly enrolled member of the dairy school of this college during the session of 189—, has attended the lecture courses, has done the prescribed work with the separators and churns and in milk testing, and has been found proficient by his instructors in the exercises required.

Given at ———, ———, this ——— day of———, 189—.

———— ————,
Professor of Agriculture.

————— ————,
Creamery Instructor.

[SEAL.] Countersigned:

————— ————,
President of the College.

A student may finish the work of the dairy school and be able to make the best butter or cheese under similar conditions as were there afforded him, but he can not always do as well under the adverse circumstances sometimes met by practical butter and cheese makers. To successfully cope with all conditions long experience is required. Sometimes the certificate is not given until the student has had one or two seasons of practical work, concerning which a blank statement similar to the following is filled out and sent in monthly:

Blank used for report in creamery work by the Wisconsin Dairy School.

Report by ——— ——— for the month of ———, 189—.

Name of creamery in which you work.....
Location of creamery: P. O....., County....., State.....
Nearest railway station.....
What position do you hold, first man or helper?.....
Is creamery cooperative or private?..... Number of patrons.....
Number of cows..... Pounds of milk received daily.....
Distance to next creamery or cheese factory.....
Distance from creamery to farthest patron.....
Are dividends made according to the per cent of fat in the milk?.....
Do you use composite test?..... How often is each patron's milk tested?.....
What is the highest per cent of fat found in any patron's milk during this month?..
What is the lowest per cent of fat found in any patron's milk during this month?...
Average fat in mixed milk from all patrons.....
What separator is used?..... About what proportion of cream is taken?.....
At what temperature is milk separated?.....
How much milk is separated per hour?.....
What per cent of fat is left in skim milk?.....
Have you been troubled by separator churning the cream?.....
How is cream ripened?..... How long is cream held before churning?.....
At what temperature is cream kept?.....
At what temperature is it churned?.....
How long on the average is cream churned?.....
Is butter worked once or twice?..... How much salt is used?.....
What kind of salt do you use?..... Are you bothered with mottled butter?....

How much fat is left in buttermilk?.....
What per cent lactic acid is in cream when churned (Mann's acid test, or Farrington's tablet)?.....
How much butter, packed ready for market, is made from one pound of fat, as shown by test?.....
How much butter has been sold during the month?.....
State highest, lowest, and average prices obtained.....
How much is charged per pound for making?.....
Do patrons take back skim milk?.....
How is skim milk divided among patrons?.....
Remarks:

In addition to this he is visited at his factory by his former dairy instructors, whose reports must show that the factory is well conducted. A certificate based on these conditions is a valuable thing, and of course a great aid in securing a position.

The practice of giving prizes to the best students has been adopted in some schools. The award of these prizes is based entirely on the work done at the school. They furnish an incentive to put forth one's best efforts and they make the school work more interesting by causing friendly competition. It has been the custom in some schools of England to give the best students an extended and advanced course without cost.

COST OF DAIRY COURSE.

In a few cases tuition is required of all students admitted to the dairy course, but this is never a large amount, rarely exceeding $15. A deposit of from $2 to $5 is usually made to cover any loss by breakage, and the amount of this remaining unused is returned to the student at the end of the term. Each member of the course is given a full set of glassware for testing milk, and if he meets with no accident and returns a complete set he receives back the entire amount of his deposit. If a few pieces are broken, enough is deducted from the deposit to replace them and the remainder is returned. Board and room can be found at prices varying from $2.50 to $5 per week and laundry work costs about 50 cents more each week. Most schools require students to wear white suits when at work in the dairy building. Those made of white duck, similar to the ones worn by painters, are very satisfactory and can usually be obtained for $1 a suit. Each student should have at least two suits. The incidental expenses depend largely on the individual; they can be kept quite low if necessary.

It is thus seen that the total cost of attending a dairy school is very reasonable—exclusive of the railroad fare in going and returning—it may even be as low as $25. With few exceptions $50 will cover the entire outlay. Some energetic young men have been able to make a large part of their expenses while attending such a school by working in the barns and on the farms connected with the college, but it is not safe to depend on this unless assured beforehand that work can be obtained, as there are seldom as many positions as persons seeking them.

In the brief statements of the schools, in the appendix, the estimated amount of the required expense in each case is given. Laundry and incidentals are not included. Each student should have a few blank books for taking notes in the lectures and laboratories. The price of board and room varies with the location and the accommodations offered; the lowest price is usually stated.

EQUIPMENT.

A few schools are equipped with buildings which have been erected at the expense of the States for the purpose of dairy instruction only. These buildings are as complete and perfect in construction and as fine in appearance as other college buildings and lack nothing in arrange-

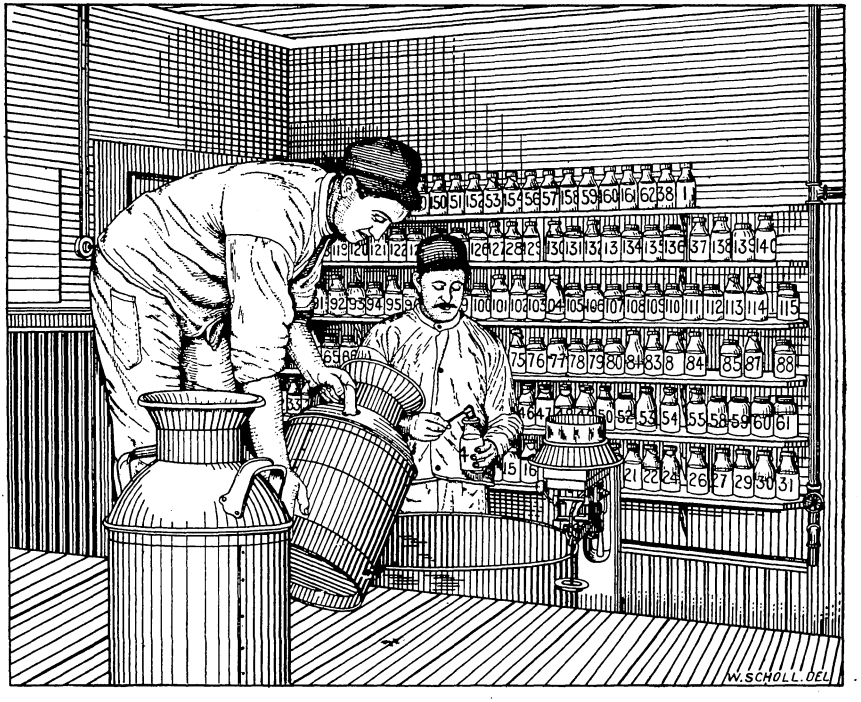

FIG. 1.—Receiving and sampling milk, college creamery, Iowa.

ment or equipment which would aid in the purpose for which they are intended (Pl. I). They contain both lecture rooms and work rooms, also laboratories, reading rooms, libraries, bath rooms, and dressing rooms. Each building is so arranged that all the work connected with butter making is done in a part by itself, and practical cheese making is carried on in another part. The work rooms are arranged as nearly as possible like a modern creamery or cheese factory. The receiving room (fig. 1) contains a receiving can, scales, various arrangements for taking samples of milk, and milk vats or conductors leading to vats in

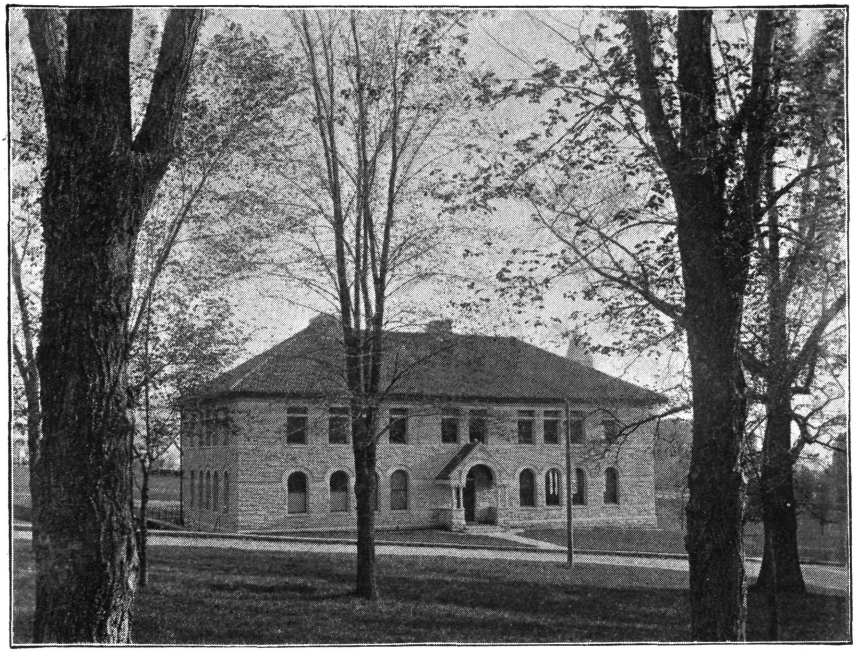

FIG. 1.—DAIRY HALL, NEW YORK.

FIG. 2.—DAIRY HALL, WISCONSIN.

FIG. 1.—CHURNING ROOM, DAIRY SHORT COURSE, WISCONSIN.

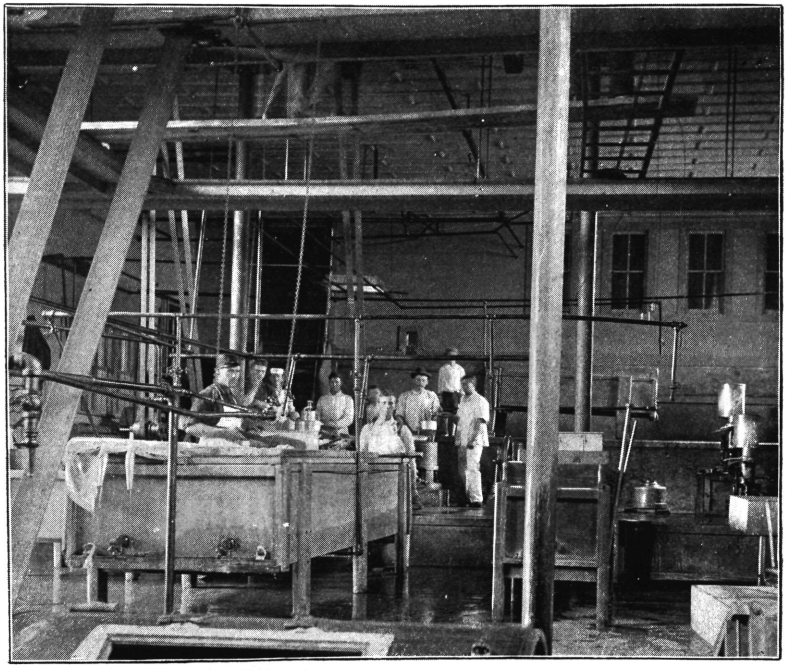

FIG. 2.—OPERATING SEPARATORS, CREAMERY COURSE, IOWA.

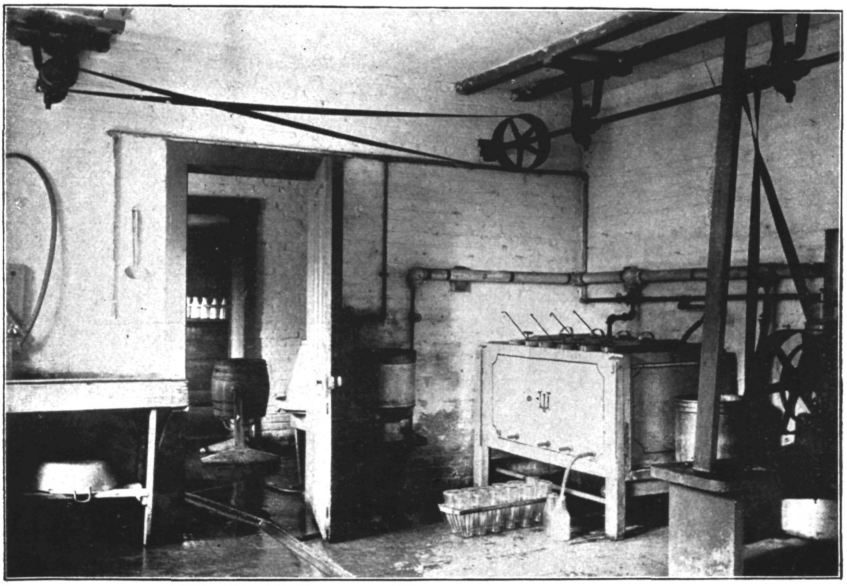

FIG. 1.—PASTEURIZING MILK, ILLINOIS.

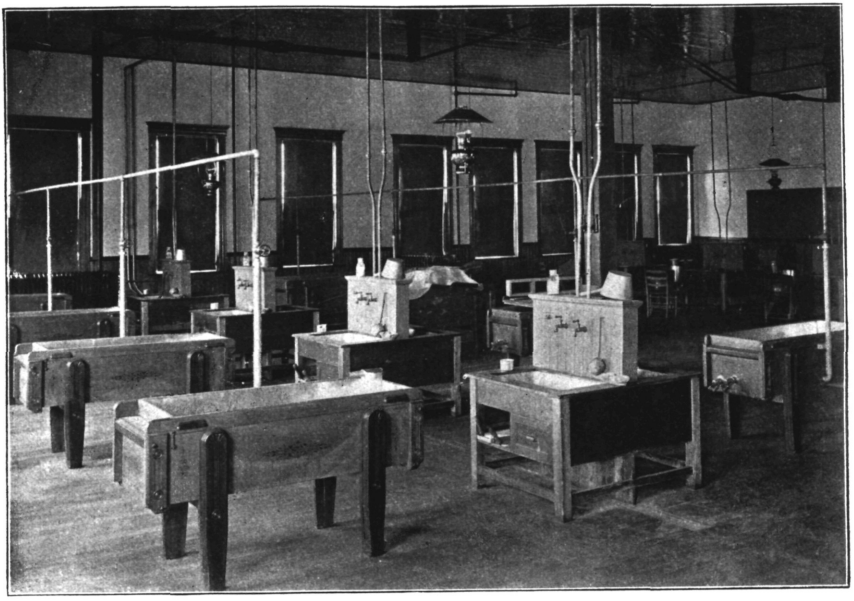

FIG. 2.—CHEESE ROOM, MINNESOTA.

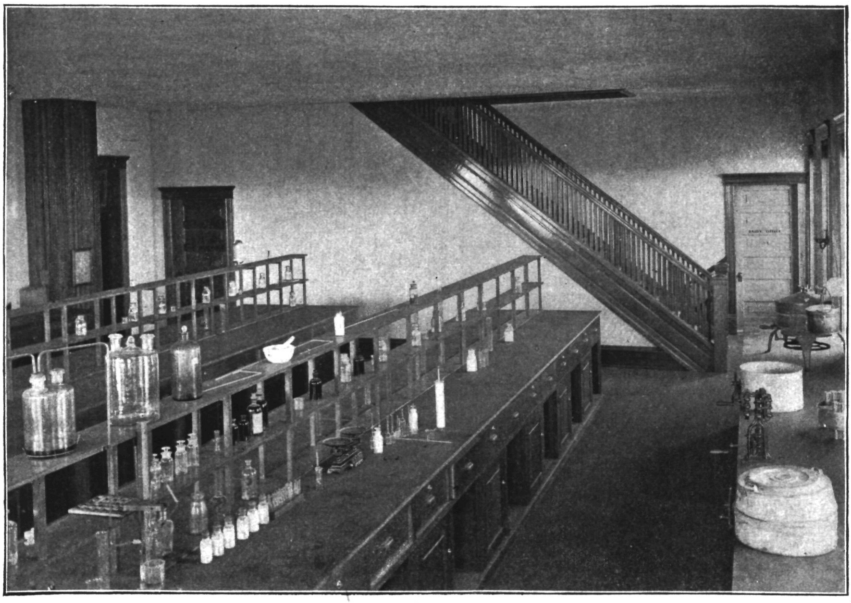

FIG. 1.—MILK LABORATORY, MINNESOTA.

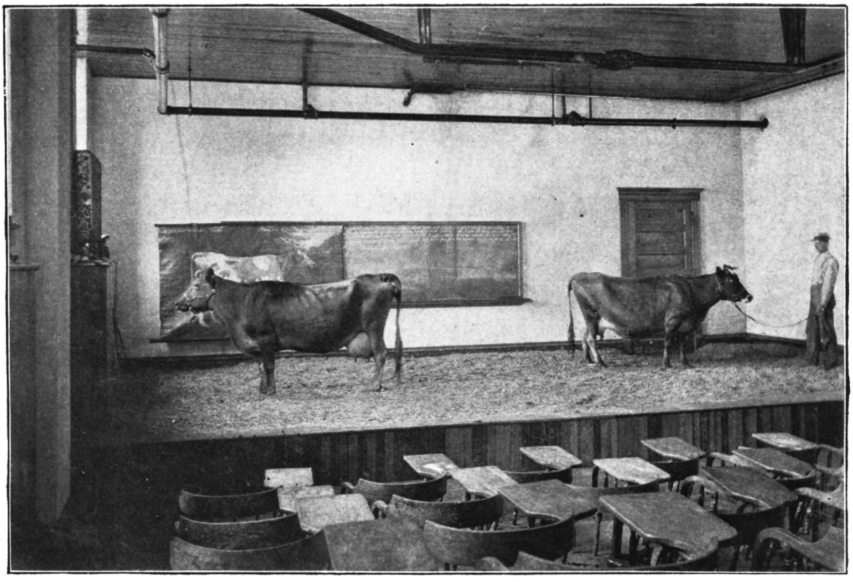

FIG. 2.—LIVE STOCK LECTURE ROOM, MINNESOTA.

another room. The butter room (Pl. II) is fitted with all the apparatus necessary to make large or small amounts of butter—separators, cream ripening vats, churns, and butter workers, and usually different styles of each kind of machinery are in use, so that several squads can be working at the same time on the same kind of work, but with varied appliances. Each student changes from one kind of apparatus to another until he becomes familiar with all. Manufacturers frequently loan dairy machinery to the schools, thus getting a good opportunity to make their implements known, while the equipment of the school is increased and improved. In the cheese room (Pl. III, fig. 2) are found small cheese vats and all the accessories necessary in cheese making. In connection with this room is the curing room, where it is customary to keep careful record of the heat and moisture conditions throughout the term.

The laboratory (Pl. IV, fig. 1) resembles in many respects a chemical laboratory. Long benches are provided with drawers and closets, sinks, hot and cold water, and gas. Numerous testing machines run by direct steam jets, belt, and hand power are placed in the laboratory. Jars of sulphuric acid with rapid measuring arrangements for use in filling test bottles and apparatus for the acid tests and other experimental and chemical work have their place in this room. Each student keeps the glassware necessary for testing milk, cream, and skim milk in his own locker. Usually the lactometer and acid tests are used, and some of the earlier known rapid fat tests are sometimes shown. The reading room and library contain numerous dairy papers and books, herd books, etc. When special rooms are provided for instruction in farm dairying they are equipped with hand churns and separators, the conditions being made as near like those of a model farm dairy as possible. A special room is used for the engine and boiler, and instruction may here be given in firing, steam fitting, plumbing, and the care of the engine. (Pl. II, fig. 1.)

The lecture room is fitted with seats, having a wide folding arm rest suitable for holding a notebook. Blackboards and charts are on the wall for use in illustrating the lectures. A live stock lecture room (Pl. IV, fig. 2) is now in use in a few schools. It contains a large platform where animals can be brought in full view of the class and their peculiar and prominent points of excellence or failure discussed.

Schools not equipped with buildings as above described usually operate a creamery and perform all practical work in a building by itself, and conduct class-room work in other buildings. The fact that they have no costly structure is not evidence that they can not give good dairy instruction. (Pl. III, fig. 1.) (See fig. 2, text.)

Most dairy schools control herds of cows which furnish a part of their milk supply. In some cases these are pure bred, and the herd may contain animals of several different breeds; in other cases grade herds are kept with the intention of illustrating how a good herd can

be built up from native stock at little or no more expense than is required to keep an ordinary herd with no improvement from year to year. The advantage of having cows of the best types, and medium good and poor animals, is evident.

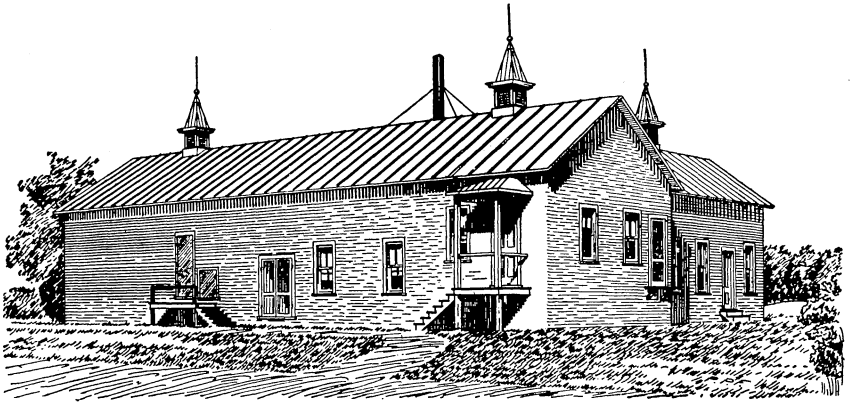

FIG. 2.—College creamery at Fargo, N. Dak.

Other facilities which aid in giving dairy instruction consist of college and experiment station libraries and farms well equipped with buildings and machinery, silos, feed cutters, grinders, and, frequently, electric power. The associations formed at dairy schools may become of great value long after the course is ended.

ADVANTAGES OF A DAIRY COURSE.

The benefits of a dairy course are so many that only a part of them can be mentioned here. The chief advantage of any kind of education is that it trains one to think. Dairymen should know *why* as well as *how*, and the one who understands the reasons for each of the steps in making dairy products is the one who most successfully meets unexpected and unfavorable conditions when they occur. Good operators who can think and who possess some original resources are wanted by creamery and cheese-factory managers. The latter are not slow to learn that an employee, understanding practical dairy work and capable of sound reasoning, is worth much more than the one who acts mechanically. If the skim milk or whey can be made to test one-tenth per cent less in butter fat, they want the man who can do it. There is a demand for good dairymen, and it is doubtful if many up-to-date butter makers or cheese makers can be found in the army of "educated unemployed;" such men are needed in too many places. The best students from the

dairy schools are usually successful in securing first-class positions; in fact, the schools are sometimes unable to fill all the positions referred to them because of the lack of candidates.

Another benefit of special dairy training is, it makes one more independent. It frequently happens that the profits from a dairy concern can be much increased by changing the kind of product. If the butter market is depressed, it may be well to manufacture cheese for a time, or if the milk market is flooded, it will very likely be advantageous to the shipper or the dealer to make butter or cheese for a few days, until normal conditions of the market are resumed. This matter of being able to change at the right time may save many dollars' worth of milk which would otherwise be a total loss.

A great advantage of dairy schools is that they teach the same methods to all students, and in this way have much influence in making dairy products more uniform. Butter and cheese have been justly criticised for lack of this quality, but greater uniformity is already noticed as the result of dairy school training. Though several different lots of butter, alike except in minor particulars, may be equally good, they do not sell as well on the market as they would if more alike. When the makers in any section have been trained to ripen their cream in the same way, churn it at the same stage, use salt and color in the same degree, and pack the product in the same way, material benefits will accrue to all the creameries in that community.

From a financial standpoint a short dairy course may be regarded by an ambitious person who is much interested in dairying as a good investment. Many earnest men and women, limited in both time and money, have been able to help themselves very considerably by making the most of a few weeks at a dairy school. It must be remembered that tact and skill and keen interest in the work are necessary; without these the manager of a new and promising dairy enterprise may ruin it, but with them an ordinary place may be made to prosper and be a source of great profit to the community. Many run-down and struggling creameries are scattered through the country; often their unprosperous condition is due to a small supply of milk—this is beyond the control of the operator. But the trouble is sometimes in the factory itself, and in such a case an intelligent, energetic operator is usually the one thing needed.

A few cases may be cited showing how dairy schools have benefited individuals. A young man who had spent all his life at ordinary farm work and had very little knowledge of dairy methods took a ten weeks' creameryman's course and at its close obtained a position in a creamery paying $50 a month for ten months in the year. Before taking the course he had been getting $25 about eight months each year. Fifty dollars covered his entire expense at the school and by the outlay of this amount he more than doubled his income. The next winter he returned to the dairy school, heard the lectures a second

time, repeated a part of the work, and took some advanced study. He then secured a position which paid him $55 per month with house rent free. The creamery of which this young man has charge has a neat, tidy appearance. He is agreeable to patrons and has the reputation of being the best creameryman in the community.

If one has had no practical experience in factory work he should endeavor to get at least one season's work as helper to a first-class maker. A man about 30 years of age had spent his life at general farm work. He decided to learn butter making and took a short dairy course, at the completion of which he became helper in a creamery at $27 a month. The next year he was butter maker in another creamery at a salary of $50 per month, and the next year, with one helper, he took charge of a large plant at a salary of $60 per month and free house rent. The beginning of this improvement was a determination to excel in dairy work, and the first act was to attend a short dairy course which cost, in all, about $50.

A young man who had just finished school attended a three months' dairy course at a total cost of nearly $75. The next summer he took full charge of a creamery receiving 12,000 pounds of milk a day, and besides making the butter kept the books and apportioned payments on the basis of fat delivered. His butter was awarded both first and second premiums in a close contest at the county fair. He was paid $65 a month. The next year he took full charge of a large creamery producing almost a ton of butter a day and had three assistants,—salary $80 per month.

Similar examples could be given of cheese makers receiving much help by a dairy school training and the marked success of young women could also be cited. At a recent Western State fair more than half the premiums on dairy products were taken by students holding dairy school certificates. These illustrations are given to show that a short scientific training in dairying can be made good use of by a practical person who wishes to learn more of creamery or cheese-factory work.

Special dairy training can be a means of just as great profit to the dairy farmer as to the factory operator. The butter produced on farms is far from perfect. As a rule, it sells for several cents less than the "best creamery," although some farmers receive the highest market price for their product. It is not an uncommon occurrence for two farmers living close together, having the same kind of stock and the same advantages for dairying, to differ 50 per cent in the profits from their herds. Lack of uniformity is a chief criticism of farm dairy butter. This is mainly due to different methods in the care of milk and cream and in making the butter, and defects resulting from the incompetency of the maker. The dairy school offers to the busy farmer or any member of his family a quick and cheap way of learning the best methods. The value of farm dairy butter should be materially increased; this can be easily done, and would mean many thousands of

additional dollars to farmers. Farm dairy butter is often excellent in all points but one or two, which could be easily corrected. For example, it may not be well packed, though all right in other particulars; in such a case the use of a better package may raise the price a few cents per pound. Neat packages of well-made butter have been the means of lifting many mortgages.

Dairying has recently come to be regarded as the most profitable branch of agriculture in many localities where grain raising or general farming had been the leading occupation and farmers have been compelled to give their chief attention to their herds. Those who have not been in the business long, or have never put their best effort into it, little appreciate the great losses due to poor methods in feeding, selecting, and caring for stock and preparing the product for market. It has been shown repeatedly that one cow may easily produce twice the butter of another, making her profit more than double the profit from the poor cow. The lectures and practical work on selecting, judging, and managing stock give valuable instruction on these matters. It is claimed that the fat which remains in the skim milk and buttermilk on farms would increase the yield of farm dairy butter 25 per cent if it could be saved. Nearly all of this can be saved by the careful practice of modern methods.

ADVANTAGES OF DAIRY SCHOOLS TO THE PUBLIC.

Dairy schools are a benefit to the public as well as to the few individuals who attend them for instruction. In countries where they have been in operation for many years this is very evident, and in parts of this country the benefits may already be seen. Each school becomes a center for advanced dairy thought and each successive year, as class after class goes out, its influence is widened. Every student carries new ideas to his home, and though some may make little use of the training others will make much of it, both in their own work and in helping their neighbors. The creamery or cheese-factory operator occupies a peculiar place in the community; he is in a position to do much more than simply receive milk from the patrons and manufacture the product. If he understands the care and feeding of cows, the compounding of rations, value of manures, and, especially, the proper care of milk before its delivery at the factory, his advice on these things is of great value to the farmers whom he meets daily. The more the influence of these schools can be spread the greater will be their good to the public. Besides the community in which they are located, they benefit distant consuming communities by improving and cheapening dairy products.

If the money expended in the support of dairy schools is well used, a small amount of it is capable of doing great good. Many schemes have been proposed for aiding schools in the instruction of dairymen. In England traveling dairy schools have been tried with some success.

Dairymaids are sent out to remain on a single farm several days, teaching the best methods of conducting the dairy with whatever appliances may be at hand. With some persons sufficient interest is aroused to lead them to take a short course at a dairy school. This system of instruction could be followed with profit in parts of this country, especially in the outlying districts. If means were available, capable instructors might be advantageously employed for the entire year, spending the winter at dairy schools and the remaining months in the field. Valuable service for the State could be rendered by visiting farms and factories and showing in each place how the best product can be made under the conditions furnished. It is an excellent plan for dairy school instructors to visit their students after the completion of the course, when they have taken up practical work, to aid them in putting into practice the ideas gained at the school and to see if conditions exist which permit successful work.

The importance of instruction in farm dairying is very great. About 85 per cent of the butter produced in this country is made on farms, and as the quality of our dairy products as a whole can not be much improved until this large proportion shows improvement, the need is very evident of offering every inducement to learn to those who make butter in small amounts on the home farm. Several agencies have been used to supplement the efforts of the dairy schools in this line. Dairy conferences have been held in this country and good results thus accomplished. Courses of reading similar to the Chautauqua courses have been started; these might be directed from the dairy schools. Systematic instruction can also be given by correspondence.

APPENDIX.

Brief statements follow, showing the facilities for instruction in dairying now offered in the several States. Some schools receive generous support from the States in which they are located, and have everything necessary to enable them to do much good work. In other States the equipment is not on an elaborate scale; in a few there are no dairy schools, as there seems to be no demand for them. When the need for widespread education in dairy lines is better understood and the good results which accrue from such education are better appreciated, even more facilities for instruction will be offered than is the case to-day.

In the statements following, the names and locations of the different schools are given, together with the officers in charge and the proper officials to address for further information. The different courses of study which are offered are briefly described, the approximate cost of these courses stated, and certain features of the equipment referred to. In States where a large number of people are interested in dairying the classes at the dairy schools are usually large, and there is a correspondingly large force of instructors; some schools have been obliged to refuse admission to applicants on account of lack of room.

When one has concluded to attend a dairy school it is not always an easy matter to decide where to go. The school in his own State would be the natural place to choose, as it probably makes a specialty of the kind of dairying most practiced in that State. Each school naturally has the interests of its own State uppermost; for example, if cheese making is prominent in a certain State, that branch of the industry is likely to receive special attention at the dairy school of that State. If it is decided to attend a school in another State, the list following may be consulted, and when a few are found that seem to meet the requirements, their circulars should be obtained for further information:

ALABAMA.

Agricultural and Mechanical College of Alabama, Auburn.

[William Leroy Broun, M. A., LL. D., president; J. F. Duggar, M. S., professor of agriculture.]

For full information concerning dairy instruction, address Prof. J. F. Duggar, Auburn, Ala.

A regular short dairy course is not offered. A person desiring instruction in farm dairy work can spend the fall term of three months at the college and take dairying and allied subjects.

Cost: Fees, $6; board and room, per week, $2.50. (No uniform required.)

Equipment: A creamery, hand separator, and outfit for making butter in small quantities.

Other facilities: Experiment station and neighboring dairy herds.

Tuskegee Normal and Industrial Institute (incorporated), Tuskegee.

[Booker T. Washington, principal; J. H. Washington, superintendent of industries.]

For full information concerning dairy instruction address Prof. J. W. Hoffman, Tuskegee, Ala.

This institution is established for the education of colored young men and women. A course of eight months is offered in farm dairying, beginning early in September. Instruction is given by lectures and practical work. The lectures treat of milk, butter making, dairy chemistry and bacteriology, and dairy cattle.

Cost: Tuition (for dairy course), free; board and room, per week, $2.25.

Equipment: A dairy building, well equipped for practical farm dairy work, testing of milk, butter making, etc.

Other facilities: Herd of pure bred and grade Jersey cattle.

ARIZONA.

University of Arizona, Tucson.

[Howard Billman, M. A., president; William Stowe Devol, B. Agr., professor of agriculture.]

For information concerning dairy instruction, address Prof. William S. Devol, Tucson, Ariz.

No regular short dairy course is offered; some dairy instruction is given, however, in the regular agricultural course. A person can attend for a brief period and receive instruction in dairying any time during the session of the university by making special arrangements with the professor of agriculture.

Cost: Tuition, free; board and room per week, $4.

Equipment: Facilities for making butter and cheese.

ARKANSAS.

Arkansas Industrial University, Fayetteville.

[J. L. Buchanan, M. A., LL. D, president; R. L. Bennett, M. S., superintendent of agriculture.]

For full particulars concerning dairy instruction, address Prof. R. L. Bennett, Fayetteville, Ark.

A regular short dairy course is not offered, but instruction in dairying may be taken for a brief period in the winter term by making special arrangements with the professor of agriculture.

Cost: Tuition, free; board and room per week, $3.

Equipment: All necessary appliances for conducting a modern dairy.

CALIFORNIA.

College of Agriculture and University of California, Berkeley.

[M. Kellogg, LL. D., president; E. W. Hilgard, Ph. D., LL. D., professor of agriculture.]

For full particulars concerning dairy instruction, address Prof. E. J. Wickson, Berkeley, Cal.

A special dairy course is not offered. A course of three lectures per week, beginning the middle of August and continuing six months, treats of stock breeding and dairy husbandry. This is given in connection with a lecture and laboratory course in dairy feeding. A laboratory course in the chemistry of milk and dairy products is also given. Special students who are qualified to carry out the work are taken for any period.

Cost: Laboratory fee per annum, $10; board and room per month, $20.

Equipment: Laboratory fully equipped for analyses of dairy products and feeding materials and with apparatus for milk testing. Growth of forage plants adapted to arid conditions.

COLORADO.

The State Agricultural College of Colorado, Fort Collins.

[Alston Ellis, M. A., Ph. D., LL. D., president; W. W. Cooke, B. S., M. A., professor of agriculture.]

For full particulars concerning dairy instruction, address Prof. W. W. Cooke, Fort Collins, Colo.

Instruction in butter making in small amounts is given in the short course of agriculture. Any person can receive instruction in milk testing at any time.

Cost: Tuition, free; board and room per week, $3.

Equipment: Deep-setting apparatus, hand separator, and appliances for making butter in small lots. Efforts are being made to have a building erected suitable for giving instruction in creamery work.

Other facilities: A herd of cows supplies part of the milk used.

CONNECTICUT.

Storrs Agricultural College, Storrs.

[B. F. Koons, Ph. D., president; C. S. Phelps, B. S., professor of agriculture.]

For full information concerning dairy instruction, address Prof. C. S. Phelps, Storrs, Conn.

A short dairy course is not offered, but special students are admitted during the winter term of twelve weeks, and can put all their time on dairying and allied subjects if they so elect. Twenty lectures are given on dairy farming, the composition and testing of milk, manufacture of butter and cheese, and the preparation of milk and cream for market. The practical work consists of testing milk, separating milk by gravity and centrifugal methods, and butter making.

Cost: Tuition, free; board and room per week, $3.

Equipment: One thousand five hundred dollars have recently been appropriated for new dairy machinery, and complete modern apparatus for giving instruction as outlined will be purchased. A complete dairy building is in process of construction, the creamery wing of which will be ready for use in January, 1897.

Other facilities: One thousand eight hundred dollars have been appropriated for the purchase of thoroughbred stock.

DELAWARE.

Delaware College, Newark.

[George A. Harter, M. A., Ph. D., president; W. H. Bishop, B. S., professor of agriculture.]

For information concerning dairy instruction, address Prof. W. H. Bishop, Newark, Del.

No regular short course in practical dairying is offered. Some dairy instruction is given by lectures in the agricultural course, and any person so desiring can take this work with other agricultural subjects in the short winter course.

Laboratory instruction in the use of the Babcock tester is also given.

Cost: Tuition, free; board and room per week, $3.50.

Equipment: Babcock tester.

FLORIDA.

In Florida no instruction in dairying is offered at the State Agricultural College, located at Lake City.

GEORGIA.

Georgia State College of Agriculture and Mechanic Arts, Athens.

[H. C. White, Ph. D., president; J. B. Hunnicutt, B. A., professor of agriculture; H. J. Wing, instructor in dairying.]

For full particulars concerning dairy instruction, address H. J. Wing, Athens, Ga.

A regular short dairy course of two to three weeks in March is offered, and students desiring special instruction in milk testing or butter or cheese making are admitted at any time.

Cost: Tuition, free; board and room per week, $2.50.

Equipment: A dairy building is fitted with the necessary apparatus for the work outlined.

IDAHO.

College of Agriculture of the University of Idaho, Moscow.

[F. B. Gault, M. S., president; C. P. Fox, M. Agr., professor of agriculture.]

For information concerning dairy instruction, address Prof. C. P. Fox, Moscow, Idaho.

Dairy course: A six weeks' course in farm dairy work commences early in November.

Cost: Tuition, free; board and room per week, $3.50.

Equipment: Power and apparatus necessary for making butter and testing milk.

INDIANA.

School of Agriculture, Horticulture, and Veterinary Science of Purdue University, Lafayette.

[James H. Smart, M. A., LL. D., president; William C. Latta, M. S., director of the school of agriculture; C. S. Plumb, B. S., professor of animal industry and dairying.]

For full information concerning dairy instruction, address Prof. W. C. Latta, Lafayette, Ind.

Dairy course: An eleven weeks' course in farm dairying commences early in January. It is given in connection with other lines of agricultural instruction. The daily work consists of lectures on dairy subjects followed by practice in the dairy.

Students entering this course must be at least 16 years of age.

Cost: Students from Indiana, tuition, free; students from other States, tuition, $10; deposit for breakage (returnable), $2; incidental fee,* $10; board and room, per week, $2.50.

Equipment: A dairy building of five rooms is furnished with a complete outfit for making butter and cheese and for testing milk.

ILLINOIS.

College of Agriculture of the University of Illinois, Urbana.

[Andrew S. Draper, LL. D., president; Eugene Davenport, M. Agr., professor of animal husbandry and dean, W. J. Fraser, instructor in dairying.]

For full information concerning dairy instruction, address Prof. Eugene Davenport, Urbana, Ill.

Dairy course: The department of dairying has recently been established. A short course in farm dairying will be offered commencing early in January. Instruction will be given in testing and pasteurizing milk and cream, and making butter in small amounts.

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* Two scholarships are offered each county agricultural society, farmers' institute, F. M. B. A., grange, etc., and the persons to whom these are granted are exempt from the incidental fee of $10.

Cost: Tuition, free; board and room per week, $3.

Equipment: The dairy building contains a small engine and boiler, pasteurizer and apparatus for making butter in small churnings, and arrangements for handling milk for city trade.

IOWA.

Iowa State College of Agriculture and Mechanic Arts, Ames.

[W. M. Beardshear, M. A., LL. D., president; James Wilson, professor of agriculture; G. L. McKay, instructor in dairying.]

For information concerning dairy instruction, address Prof. James Wilson, Ames, Iowa.

Courses: (*a*) An eight weeks' winter school in dairying commences early in January. It is planned for those who wish to make a specialty of dairying, and is mostly attended by men who have had practical experience in dairy work. Six half days per week are spent in practical work in the butter and cheese departments; class-room instruction is given by daily lectures on dairy operations, chemistry, bacteriology, and bookkeeping.

(*b*) and (*c*) Two summer schools of dairying begin, respectively, in February and July, and continue sixteen weeks. Instruction covers the same ground that is gone over in the winter course, but as the term is longer the different parts of the work can be taken up in greater detail; some experimental work is conducted.

(*d*) A one year's course is offered, and students successfully completing it are given certificates.

Cost: Tuition, free; board and room per week, $3.50; two white suits, $2.

Buildings: The dairy instruction is given in a building fitted as a large creamery, which is operated throughout the year. A cheese room, laboratory, class room, dressing room, and dwelling apartments are in the same building.

Equipment: The building is fitted with the necessary apparatus for making butter and cheese in large or small amounts and for testing milk.

Other facilities: A herd of cows representing six different breeds of cattle is kept on the farm and stabled in a building fitted with the latest improvements for dairy barns.

KANSAS.

Kansas State Agricultural College, Manhattan.

[George T. Fairchild, LL. D., president; C. C. Georgeson, M. S., professor of agriculture.]

For information concerning dairy instruction, address President George T. Fairchild, Manhattan, Kans.

No regular short course in dairying is offered. Instruction in the theory and practice of making butter in small amounts is given for ten weeks each spring term to the young women in the second year of the regular agricultural course.

Equipment: Deep and shallow setting apparatus for raising cream and appliances for making butter in small amounts.

KENTUCKY.

Agricultural and Mechanical College of Kentucky, Lexington.

[J. K. Patterson, Ph. D., president; C. W. Mathews, B. S., professor of agriculture; M. A. Scovell M. S., lecturer on dairying.]

For full information concerning dairy instruction, address Prof. C. W. Mathews, Lexington, Ky.

Dairy course: Instruction in farm dairying is given in connection with the regular eight weeks' short course in agriculture, beginning early in January. The field of

dairying is covered briefly by lectures; the practical work consists of fifteen 2-hour hour exercises in testing milk and making butter and cheese.

Cost: Tuition, residents of Kentucky, free; room and board per week, $3.

Equipment: A dairy house has recently been erected and fully equipped for experimental work in handling milk and making butter and cheese.

Other facilities: A herd of cows on the college farm.

LOUISIANA.

In Louisiana no instruction in dairying is offered at the State Agricultural College, located at Baton Rouge.

MAINE.

Maine State College, Orono.

[Abram W. Harris, M. A., D. Sc., president; Charles D. Woods, B S., professor of agriculture.]

For full information concerning dairy instruction address Prof Charles D. Woods, Orono, Me.

Dairy course: A six weeks' course in dairying is offered, commencing in January. It is designed for those who wish to become expert butter or cheese makers. If it is pursued two terms, and two seasons' satisfactory work is performed in a butter or cheese factory, the student will be granted a certificate of proficiency. Practical work is conducted each afternoon; in the mornings lectures are given on dairy cattle, dairy products and operations, care of boilers, diseases of cattle, and business law.

Cost: Tuition, free; board and room per week, $3.50; two white suits, $2.

Equipment: A building especially constructed for instruction in dairying is fitted with modern dairy appliances for testing milk and making butter and cheese.

MARYLAND.

Maryland Agricultural College, College Park.

[R. W. Sylvester, president; W. T L. Taliaferro, professor of agriculture.]

For information concerning dairy instruction, address Prof. H. J Patterson, College Park, Md.

No regular short dairy course is offered. Instruction in dairying is given to the agricultural students and twelve weeks of work in general dairy lines is offered to others each winter.

Cost: Tuition, $5; board and room per week, $5.

Equipment: A newly equipped dairy building.

MASSACHUSETTS.

Massachusetts Agricultural College, Amherst.

[Henry H. Goodell, LL. D., president; William P. Brooks, B. S., professor of agriculture.]

For full information concerning dairy instruction, address Prof. William P. Brooks, Amherst, Mass.

Dairy course: (*a*) An eleven weeks' course in creamery work commences early in January. Lectures are given on the principles of dairy farming, breeding and management of cattle, cattle diseases, stable construction, bookkeeping, composition of milk, pasteurization, milk testing, and butter making. Practical creamery work is conducted.

Applicants for this course must be 16 years of age or over.

Cost: Tuition to citizens of the State, free; laboratory fees, cost of materials; board and room per week, $3.75; two white suits, $2.

(*b*) A course in farm dairying is conducted at the same time in connection with the short winter course in agriculture.

Equipment: A wing of the barn, containing several rooms, has been fitted with modern machinery for practical and educational work in dairying as above outlined. Power is furnished by an electric motor.

Other facilities: A herd of selected grade cows is being bred with especial attention to their dairy qualifications; museum of illustrative material; agricultural library.

MICHIGAN.

Michigan Agricultural College, Agricultural College.

[J. L. Snyder, Ph. D., president; Clinton D. Smith, M. S., professor of agriculture.]

For full information concerning dairy instruction, address Prof. C. D. Smith, Agricultural College, Mich.

Dairy course: A six weeks' course in farm dairying is offered. The course begins early in January. Instruction is given by lectures and practical work, special attention being given to chemistry of milk, butter making, and stock judging and feeding. Practical butter making is conducted six half days each week and work at the barn mornings and afternoons.

Equipment: The basement of the experiment station building is fitted up for butter making in small amounts. Studies in bacteriology and chemistry are conducted in fully equipped laboratories.

Other facilities: A herd of cows representing eight different breeds is on the college farm; various forms of silos, stalls and fixtures are in operation.

MINNESOTA.

College of Agriculture of the University of Minnesota, Minneapolis.

[Cyrus Northrup, LL. D., president; William M. Liggett, dean. School of Agriculture, St. Anthony Park Henry Webb Brewster, Ph. D., principal; T. L. Haecker, professor of dairy husbandry, in charge of dairy school.]

For full information concerning dairy instruction, address Prof. T. L. Haecker, St. Anthony Park, Minn.

Dairy courses: (*a*) A four weeks' course, commencing early in January, is designed for butter and cheese makers who have had at least one season's experience in factory work. The course consists of sixty lectures on the various branches of dairying and closely allied subjects. The practical work consists of the making of butter in small and large amounts, manufacture of cheese, including the Swiss, brick, Edam, and Gouda varieties, methods of testing milk, scoring butter and cheese, and practical engineering. Each morning is given to lectures and all afternoons to practical work.

Certificates of proficiency will be given to students who show themselves after two terms' work at the school and two seasons' practical work in cheese factory or creamery to be efficient in factory or creamery work.

Cost: Registration fee, $15; board and room per week, $3.50; two white suits, $2.

(*b*) Instruction in farm dairying is given in a short special course in agriculture. Lectures and practical work are given twice a week for sixteen weeks.

(*c*) A six weeks' course in early summer is offered to women, dairying and other subjects being given. The only expense of this course is $3.50 per week for board.

Buildings: Dairy Hall, specialy erected for this purpose, is a large building containing rooms for instruction in butter and cheese making, pasteurizing and testing milk, also lecture rooms, reading room, and dressing rooms.

Equipment: Complete and modern appliances and machinery necessary to the courses of instruction described.

Other facilities: A large herd representing three different breeds and the best types of grade dairy stock supplies part of the milk used at the school.

MISSISSIPPI.

Mississippi Agricultural and Mechanical College, Agricultural College.

[S. D. Lee, president; W. C. Welborn, M. S., professor of agriculture.]

For information concerning dairy instruction, address Prof. W. C. Welborn, Agricultural College, Miss.

A regular short dairy course is not offered, but instruction in dairying is given in the agricultural course. Work in the creamery is offered to any desiring it, who make special arrangements with the professor of agriculture.

Cost: Tuition, free; board and room per week, $2.

Equipment for giving dairy instruction consists of a regularly equipped creamery and large herd of dairy cows.

MISSOURI.

College of Agriculture and Mechanical Arts of the University of Missouri, Columbia.

[R. H. Jesse, LL. D., president; H. J. Waters, B. Agr., dean; F. B. Mumford, M. S., professor of agriculture.]

For full information concerning dairy instruction, address Prof. H. J. Waters, Columbia, Mo.

A special course in dairying is not offered. Three weeks of practical work in farm dairying is given in connection with the twelve weeks' winter course in agriculture, which begins early in January. A person can attend for these three weeks only if he is unable to take the complete short course. The dairy instruction consists of twenty lectures, supplemented by practical work in the care of milk and butter making. With the dairy work, subjects allied to dairying may also be taken, as lectures on stock breeding and feeding, selection and management of a dairy herd, dairy chemistry, and bacteriology.

Applicants must be 16 years of age or older.

Cost: Laboratory fee, $5; board and room per week, $3.50.

Equipment: A dairy building is equipped with Babcock testers, apparatus for pasteurizing milk and cream, and different styles of hand-power machinery for separating milk and making butter.

Other facilities: A herd of twenty thoroughbred Jersey cows is kept for illustration and practice in judging dairy cattle.

MONTANA.

The Montana College of Agriculture and Mechanic Arts, Bozeman.

[Rev. James Reid, B. A., president; Frank Beach, B. S, professor of agriculture.]

For information concerning dairy instruction, address President James Reid, Bozeman, Mont.

No regular short course in dairying is offered. Some dairy instruction is given, however, in the agricultural course, and arrangements can be made to attend for this instruction for a brief period between September and June.

Cost: Entrance fee, $10; board and room per week, $4.

NEBRASKA.

The Industrial College of the University of Nebraska, Lincoln.

[George E. MacLean, Ph. D., LL. D, chancellor; Charles E. Bessey, Ph. D., dean; T. Lyttleton Lyon, B. S. A., professor of agriculture; A. L. Haecker, instructor in dairying.]

For full information concerning dairy instruction, address Prof. T. L. Lyon, Lincoln, Nebr.

Dairy course: A twelve weeks' course in farm dairying is offered, commencing

early in January. Instruction will consist of lectures on dairy methods and closely allied subjects, supplemented by practical work in butter making and milk chemistry.

Cost: Fee, $1; board and room per week, $2.75; white suits, $2.

Equipment: A dairy house has just been completed; it contains a large work room and two class rooms. Apparatus consists of hand separators, deep-setting cans, and necessary utensils for making butter as in a home dairy.

NEVADA.

School of Agriculture of the Nevada State University, Reno.

[Joseph E. Stubbs, M. A., D. D., LL. D., president; R. H. McDowell, B. S., professor of agriculture.]

For information concerning dairy instruction, address Prof. R. H. McDowell, Reno, Nev.

No regular dairy course is offered. Some dairy instruction is given by lectures in the agricultural course, and practical work with the Babcock tester is also given. Arrangements can be made to attend for twelve weeks in the fall to receive instruction by lectures and practical work in a creamery.

Cost: Tuition, free; board and room per week, $4.00; two white suits, $2.00.

Equipment: A Babcock tester and use of a public creamery at Reno.

NEW HAMPSHIRE.

New Hampshire College of Agriculture and the Mechanic Arts, Durham.

[C. S. Murkland, M. A., Ph. D., president; Charles H. Pettee, M. A., C. E., dean; F. William Rane, B. Agr., M. S., professor of agriculture.]

For information concerning dairy instruction, address President Charles S. Murkland, Durham, N. H.

Dairy courses: A course in creamery and farm dairy work extends throughout the winter term for regular students in the college, and any four continuous weeks thereof for special students. Instruction is given by lectures, demonstrations, and practical work. Dairy husbandry, milk testing and pasteurizing, butter making, dairy bacteriology, dairy engineering, and the care of animals receive special attention. Certificates are granted upon the satisfactory completion of the term's work.

Cost: Fee, $5; board and room per week, $4; two white suits, $2.

Equipment: A creamery building is fitted with various styles of apparatus necessary for making butter and pasteurizing and testing milk.

Other facilities: A herd on the college farm contains typical animals of four different breeds and grades.

NEW JERSEY.

Rutgers Scientific School, the New Jersey State College for the Benefit of Agriculture and the Mechanical Arts, New Brunswick.

[Austin Scott, Ph. D., LL. D., president; E. B. Voorhees, M. A., professor of agriculture.]

For information concerning dairy instruction, address Prof. E. B. Voorhees, New Brunswick, N. J.

A special short dairy course is not offered. Instruction in dairying is given in the regular agricultural course.

Equipment: A dairy house fitted with modern dairy apparatus, and a laboratory fitted for testing dairy products.

NEW MEXICO.

In New Mexico no instruction in dairying is offered at the State College, located at Mesilla Park.

NEW YORK.

College of Agriculture of Cornell University, Ithaca.

[Jacob G. Schurman, D. Sc., LL. D., president; Isaac P. Roberts, M. Agr., professor of agriculture and dean; H. H. Wing, M. S., professor of animal industry and dairy husbandry.]

For information concerning dairy instruction, address Prof. I. P. Roberts, Ithaca, N. Y.

Dairy courses: (*a*) A winter dairy course of eleven weeks is offered, commencing early in January. It is especially designed to meet the needs of creamery and cheese factory men who desire more thorough instruction and to train those who expect to make butter and cheese making a profession. One lecture on dairying is given throughout the course, at 8 o'clock each morning. The management of the dairy and the operations in butter and cheese making are explained, the business management of the factory, dairy mechanics, and the care and breeding of cattle are discussed; from 9 to 10 o'clock various subjects more or less intimately related to dairying are discussed. At 10 o'clock each morning practical work is commenced, being so arranged that each student spends two days a week on each branch, viz, butter making; cheese making; and milk testing, problems, and bookkeeping. Certificates of proficiency are awarded to all who successfully complete the dairy course and one full season at an approved creamery, cheese factory, or dairy.

Applicants must be at least 17 years of age and possess a common school education.

Cost: Fee, $15; deposit to cover breakage (returnable), $4; board and room per week, $3.50; two white suits, $2.

(*b*) Instruction with special reference to the needs of the farm dairy is given in connection with the winter course of agriculture.

Buildings: A building was erected in 1893 especially for instruction in dairying and can accommodate 50 students. It contains an engine room, rooms for instruction in butter and cheese making, laboratories for milk testing, and special work; also a large lecture room, reading room, and dressing rooms.

Equipment: Various styles of all modern dairy appliances and power necessary for their operation.

Other facilities: A herd representing three different breeds and containing some high-grade animals furnishes part of the milk used at the school.

NORTH CAROLINA.

The North Carolina College of Agriculture and Mechanic Arts, Raleigh.

[Alexander Q. Holladay, president; B. Irby, M. S., professor of agriculture.]

For full information concerning dairy instruction, address Prof. B. Irby, Raleigh, N. C.

A regular dairy course is not offered, but special instruction in testing milk and making butter and cheese in small amounts is given to any who apply for it during the session.

Cost: Tuition, per month, $2; board and room per week, $2.50.

Equipment: A dairy building fitted with apparatus for testing milk and making butter.

NORTH DAKOTA.

North Dakota Agricultural College, Fargo.

[J. H. Worst, president; J. H. Shepperd, M. S. A., professor of agriculture; E. E. Kaufman, professor of dairying.]

For full particulars concerning dairy instruction, address President J. H. Worst, Fargo, N. Dak.

Dairy course: (*a*) A course of twelve weeks, beginning early in January, is offered to any who desire to become more proficient in creamery work. Lectures are given on the principles of dairying, including the handling of milk, manufacture of butter and cheese, chemistry and bacteriology of the dairy, and management of cattle.

Cost: Tuition, free; board and room per week, $3; fees, $5.

(*b*) A one year's course is designed to meet the requirements of those who have had no previous experience in creamery work. The entire field of practical dairying is covered in the course, which includes careful training in all the details of management of a creamery or farm dairy.

Cost: Tuition, free; board and room per week, $3; fees, $5.

Equipment: A model creamery, with cheese room attached, is equipped with power and all the apparatus necessary either to a creamery or cheese factory. Accommodations are limited to twelve students.

OHIO.

Ohio State University, Columbus.

[James H. Canfield, LL. D., president. College of Agriculture, Thomas F. Hunt, M. S., dean; H. J. Noyes, assistant professor of dairy husbandry.]

For full information concerning dairy instruction, address Prof. William R. Lazenby, Columbus, Ohio.

Dairy courses: An eleven weeks' course in dairying begins each year, early in January. Butter making, as practiced in the creamery and farm dairy, is thoroughly taught. The principles of cheese making are given, together with some elementary practice. Instruction by lectures includes dairy cattle and their management, manufacture of dairy products, dairy chemistry and bacteriology, and the care of the engine.

Candidates for admission must be at least 15 years of age. Those under 21 must pass an examination in grammar, geography, arithmetic, and United States history.

Cost: Fees, $15; room and board per week, $3; two white suits, $2.

Equipment: The dairy laboratory and work room is situated in the basement of Chemical Hall. It is well supplied with modern appliances for testing milk and the manufacture of butter and cheese.

Funds for the erection of an agricultural hall have recently been appropriated, and liberal provision will be made in the new building for dairy instruction. It is hoped to have it ready for occupancy in 1898.

Other facilities: A dairy of thirty cows, and a large farm equipped for investigations in stock feeding.

OKLAHOMA.

Oklahoma Agricultural and Mechanical College, Stillwater.

[G. E. Morrow, M. A., president and professor of agriculture.]

For full information concerning dairy instruction, address President G. E. Morrow, Stillwater, Okla.

A special dairy course is not offered. Instruction in dairying is given, however, in the regular course of agriculture, and one can attend for a period of six weeks during the winter term by making special arrangements. Work consists of milk testing, butter making and cattle feeding.

Cost: Tuition, free; board and room per week, $3.

Equipment: A small dairy room fitted with butter-making and milk-testing apparatus; there are also some facilities for work in bacteriology.

OREGON.

Oregon State Agricultural College, Corvallis.

[H. B. Miller, president; H. T. French, M. S., professor of agriculture; F. L. Kent, B. S. A., instructor in dairying.]

For full information concerning dairy instruction, address Prof. H. T. French, Corvallis, Oreg.

Dairy course: Instruction in farm dairying is given in connection with the farmers' short course, which commences early in January and continues four weeks.

Cost: Tuition, free; room and board per week, $2.50.

Equipment: A dairy building is furnished with tester, separator, and appliances for making butter in small amounts.

Other facilities are furnished for studying and judging dairy stock; three breeds are represented in the college herd.

PENNSYLVANIA.

The Pennsylvania State College, State College.

[George W. Atherton, LL. D., president. School of Agriculture, Henry Prentiss Armsby, Ph. D., dean; Harry Hayward, B. S., instructor in dairy husbandry.]

For information concerning instruction in dairying, address "The Dean of the School of Agriculture," State College, Center County, Pa.

Dairy courses: (*a*) A creamery course opens early in January and continues six weeks. It is designed for those especially interested in the manufacture of butter in creameries. Forty-eight lectures are given on butter making, dairy chemistry and bacteriology, dairy bookkeeping, breeding, feeding, care and diseases of dairy stock, and the management of dairy machinery. Practical butter making on a creamery scale is a daily exercise.

(*b*) A private dairy course is conducted for six weeks, commencing in the middle of February. It is designed to fit men for the management of the private dairy. Sixty-eight lectures are given on dairying, dairy chemistry, crops, dairy breeds of cattle, their care, selection, and feeding, and veterinary science. These lectures are supplemented by practical work in the dairy and barn.

Cost: Fee, $5; board and room per week, $4.50; two white suits, $2.

Buildings: Class-room work is conducted in a temporary agricultural building. The practical instruction is given in the college creamery, which is in operation throughout the year and in which instruction is offered to a few at any time. Forty students can be accommodated at one time.

Equipment: All the apparatus necessary for a creamery and farm dairy, also a pasteurizing outfit.

Other facilities: Herds representing three breeds are kept on the station and college farms and used for scoring and judging dairy cattle.

RHODE ISLAND.

Rhode Island College of Agriculture and Mechanic Arts, Kingston.

[John H. Washburn, Ph. D., president; Arthur H. Brigham, professor of agriculture.]

For full information concerning dairy instruction, address Prof. Arthur A. Brigham, Kingston, R. I.

No regular short dairy course is offered. Arrangements can be made previous to the winter term to attend during that term a course of lectures on dairying given twice a week to seniors in the agricultural course.

Cost: Tuition to Rhode Island students, free; board and room per week, $3.50.

Equipment: A dairy department has been projected and funds appropriated for purchase of dairy stock and apparatus.

SOUTH CAROLINA.

Clemson Agricultural College, Clemson College.

[E. B. Craighead, president; ——— ———, professor of agriculture.]

For full information concerning dairy instruction, address Prof. J. W. Hart, Clemson College, S. C.

A special course in dairying is not given, but instruction in practical dairy work is offered to any who apply. Butter or cheese is made daily throughout the year.

Cost: Fee, free; board and room per week, $4.

Equipment: A building especially constructed for dairy work is equipped with power and the necessary apparatus for testing milk and making butter and cheese according to the most approved methods. It can accommodate thirty students at one time.

Other facilities: A herd of eighty cattle, representing three pure breeds and their grades, furnishes the milk used in the dairy building.

SOUTH DAKOTA.

South Dakota Agricultural College, Brookings.

[John W. Heston, A. M., Ph. D., LL. D., president; E. A. Burnett, B. S., professor of agriculture; J. M. Trueman, B. S., assistant professor of dairying.]

For full information concerning dairy instruction, address Prof. J. M. Trueman, Brookings, S. Dak.

Dairy course: (*a*) A three months' course in creamery methods is offered in the winter term, beginning about the middle of November. It is designed to give full instructions in the principles and practice of creamery management. The lectures treat of the breeding and care of dairy animals, composition and testing of milk, theory of butter making, and dairy mechanics. Practical work consists of milk testing and other laboratory work and butter making three times per week.

(*b*) The course described above is repeated in the spring term

(*c*) A three months' course in cheese making is offered in the fall term, beginning the latter part of August. Instruction is given by lectures and daily practical work.

A certificate is given after satisfactory completion of the course and four months' practical work in a creamery or cheese factory.

Cost: Tuition, $1; board and room per week, $2.50; two white suits, $2.

(*d*) Farm dairying is given in the spring term to the regular students in agriculture and the young women in the course of domestic economy.

Equipment: A building is fully equipped with apparatus for testing milk and making butter and cheese in large and small quantities.

TENNESSEE.

State Agricultural and Mechanical College of the University of Tennessee, Knoxville.

[C. W. Dabney, jr., Ph. D., LL. D., president; C. F. Vanderford, professor of agriculture.]

For information concerning dairy instruction, address Prof. C. F. Vanderford, Knoxville, Tenn.

No regular short dairy course is offered. Instruction in dairying is given in the agricultural course, special attention being given to milk for immediate consumption.

Equipment: A herd representing three different breeds with selected grades.

TEXAS.

State Agricultural and Mechanical College of Texas, College Station.

[L. S. Ross, president; J. H. Connell, M. S., professor of agriculture.]

For information concerning dairy instruction, address Prof. J. H. Connell, College Station, Tex.

A regular short dairy course is not offered. Instruction in dairying is given, however, in the regular agricultural course. Special arrangements can be made to attend for a period of twelve weeks between September and March and receive instruction in butter and cheese making, handling milk, and breeding and feeding cattle. Butter is made on the dairy farm daily.

Cost: Tuition, free; board and room per week, $3.

Equipment: Milk testers and all the apparatus necessary for making butter and cheese in large and small quantities.

Other facilities: A large herd of cows and silos.

UTAH.

Agricultural College of Utah, Logan.

[J. M. Tanner, president; Paul Fischer, B. Agr., D. V. M., professor of agriculture; F. B. Linfield, B. S. A., professor of dairying and animal husbandry.]

For full information concerning dairy instruction, address Prof. Paul Fischer, Logan, Utah.

Dairy course: A ten weeks' course in agriculture and dairying commences early in January. Five exercises a week are given on the composition of milk and methods of testing it, butter and cheese making, and dairy cattle. Cheese is made once and butter twice each week.

Cost: Tuition, $2.50; board and room per week, $2.50.

Equipment: The dairy room is furnished with power and contains machinery for making butter and cheese in large and small amounts and testing milk.

VERMONT.

University of Vermont and State Agricultural College, Burlington.

[M. H. Buckham, D. D., president; J. L. Hills, B. S., professor of agricultural chemistry.]

For full information concerning dairy instruction, address Prof. J. L. Hills, Burlington, Vt.

Dairy course: A four weeks' course in creamery work is offered in January. Instruction is given in butter making and testing and pasteurizing of milk and cream. In the lecture course it is endeavored to cover briefly the entire field of dairying. The physical and chemical properties of milk receive special attention.

Certificates are granted upon the satisfactory completion of the term's work.

Cost: Tuition, free; board and room per week, $4; two white suits, $2.

Equipment: The dairy building is equipped as a creamery, and contains several styles of the different kinds of machinery employed in making butter, also milk-testing machines and pasteurizing apparatus. Accommodations are limited to fifty students.

Other facilities: Herd of forty cows, Jerseys and their grades and Ayrshires. Dynamometer and steam-consumption apparatus for testing power consumed by apparatus.

VIRGINIA.

Virginia Polytechnic Institute, Blacksburg.

[J. M. McBryde, Ph. D., LL. D., president; D. O. Nourse, B. S., professor of agriculture; Wm. D. Saunders, assistant professor of dairy husbandry.]

For full information concerning dairy instruction, address Prof. D. O. Nourse, Blacksburg, Va.

A special dairy course is not offered. Any desiring instruction in dairying for a short period will be permitted to join the class in the regular agricultural course in February. The work continues about three months.

Cost: Tuition, State students, free; board and room per month, $9.

Equipment: A creamery and cheese factory has recently been erected and fitted with all the apparatus necessary for making butter and cheese. It will be run throughout the year as a creamery on a commercial basis.

Other facilities: Four breeds of stock are represented in the herd.

Hampton Normal and Agricultural Institute, Hampton.

[H. B. Frissell, principal.]

For full information concerning dairy instruction, address C. L. Goodrich, Hampton, Va.

It is proposed to organize a systematic course in dairying next year.

Work in the dairy is performed by the students.

Cost: Tuition, free; board and room per week, $2.50.

Equipment: A gravity creamer, separator, apparatus for making butter and testing milk.

Other facilities: A herd of cows supplies the milk used at the school.

WASHINGTON.

Washington Agricultural College and School of Science, Pullman.

[E. A. Bryan, M. A., president; William J. Spillman M. S. professor of agriculture; Adolph Schoenmann, instructor in dairying.]

For full information concerning dairy instruction, address President E. A. Bryan, Pullman, Wash.

Dairy course: An eight weeks' dairy course begins about the middle of February. Two or three lectures are given daily; they treat of the care of dairy cows, practical dairy operations, management of factories, and dairy mechanics. About four hours a day is given to practical work, butter making receiving special attention the first four weeks and cheese making the remaining four weeks. It is recommended that students have some practical experience in dairy work before entering the school.

Cost: Tuition, free; board and room per week, $3.

Equipment: A creamery and cheese factory building is fully equipped with modern machinery and power necessary for making butter and cheese and for testing milk.

Other facilities: A herd of cows on the college farm supplies part of the milk used at the school.

WEST VIRGINIA.

West Virginia University Morgantown.

[J. L. Goodknight, D. D., president; L. C. Corbett, B. Agr., B. S., professor of agriculture.]

For full information concerning dairy instruction, address Prof. L. C. Corbett, Morgantown, W. Va.

Dairy course: A regular short dairy course is offered in connection with the agricultural course in the winter term of twelve weeks. Instruction is given on the management of dairy cattle, butter and cheese making, milk testing, and creamery building.

Cost: Tuition, free; board and room per week, $3; incidental fee, $2.50.

Equipment: Suitable apparatus for giving instruction as outlined.

WISCONSIN.

College of Agriculture of the University of Wisconsin, Madison.

[Charles K. Adams, LL. D., president; W. A. Henry, B. Agr., dean; E. H. Farrington, M. S., associate professor of dairy husbandry, in charge of dairy school.]

For information concerning dairy instruction, address Prof. E. H. Farrington, Madison, Wis.

Dairy courses: (*a*) A twelve weeks' course in creamery and cheese-factory work commences early in December and covers instruction in practical butter and cheese making. The work begins each week day at 8 o'clock with a one hour's lecture on dairying or an allied subject, including the composition of milk and its products, dairy bacteriology, dairy bookkeeping, care of a boiler and engine, and other physical problems of the dairy, and the breeding, feeding, and diseases of the dairy cow. After the lecture the class is divided into three sections, assigned respectively to the laboratory, creamery, and the cheese factory, the assignments being changed every two days, so that each student receives instruction in each of the three divisions of work every week. The afternoon's work closes with one hour's instruction by lectures, discussions, and quizzes on the operations of the day and scoring of butter and cheese.

(*b*) A few weeks after the beginning of the work those students showing the most proficiency are placed in an advance section to carry on experimental factory operations.

(*c*) Pupils whose standings are entirely satisfactory are allowed to take the course in pasteurization of milk and cream, this instruction being given the last four weeks of the term.

Persons taking the dairy course must be at least 16 years of age, have a common school education, and have had at least four months' experience in a creamery or cheese factory before being admitted.

Examinations are held at intervals throughout the term. Certificates are given to students after they have satisfactorily completed the full course and worked at least two seasons of seven months each in a creamery or cheese factory, provided one of these seasons follows the dairy course and the candidate practically has charge of the factory in which he works, reports his work properly, and the condition of his factory is satisfactory to an inspector sent out by the university.

(*d*) Advanced dairy instruction is offered to those who have completed the regular course. It deals with matters beyond those of the regular course, and includes experimental work in butter and cheese making and bacteriology.

Cost: Fees, $11; deposit to cover breakage (returnable), $2; board and room per week, $4; two white suits, $3; additional fee required from non-residents of Wisconsin, $16.

(*e*) The university creamery, which is in operation throughout the year, will accept at any time a few pupils without previous training, to be known as "working factory pupils," from whom no fees are asked. These are expected to remain from three months to one year, and have opportunity to become familiar with all dairy operations.

(*f*) Instruction in farm dairying is given to students pursuing the short course in agriculture. Daily practice is given in the separation of cream by deep-setting apparatus and hand separators; also in all the processes of making, printing, and packing butter.

Building: Hiram Smith Hall is entirely devoted to dairy instruction, accommodating one hundred pupils in the regular dairy course and one hundred more in the farm dairy course. It contains an engine room, creamery, cheese-making room, curing rooms, pasteurizing room, laboratories, room for instruction in farm dairying reading and lecture rooms, and dressing rooms.

Equipment: The building is equipped with different forms of apparatus for making butter and cheese in large and small amounts; also for pasteurizing and testing milk.

WYOMING.

College of Agriculture of the University of Wyoming, Laramie.

[Frank P. Graves, Ph. D., president; B. C. Buffum, M. S., professor of agriculture.]

For full information concerning dairy instruction, address Prof. B. C. Buffum, Laramie, Wyo.

A regular short dairy course is not offered. The principles of stock raising are covered in a general way by lectures in the agricultural course. Instruction in milk testing, analysis of milk and butter, butter making, and feeding will be given at any time to any who apply for it.

Cost: Tuition, $2.50; board and room per week, $4.

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